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INPUT PURCHASING ADVANTAGES OF LARGE FARMS: AN EXAMINATION OF OHIO FARMS

by

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Previous studies have indicated that large farmers are able to purchase production inputs at lower prices than small farmers (Faris and Armstrong, Krause and Kyle, and Hall and LeVeen). However, the scope of analysis of these studies was fairly limited. In an attempt to address this limitation, a survey of Ohio farm operators conducted during March of 1981 contained questions on discounts received for inputs. Results of this survey are discussed below. To place these results in perspective, their discussion is preceded by a discussion of the studies mentioned above and of the survey instrument.

Review of Previous Studies

Faris and Armstrong's study was based on a survey of prices quoted by farm input suppliers located in Kern County, California. Conducted during the early 1960s, the survey generally involved only two or three suppliers per input. Based on the survey, it was estimated that a 3200 acre cotton, alfalfa, barley and milo farm could purchase inputs for between seven and eight dollars per acre less than an 80 acre farm producing the same crop mix (Faris and Armstrong, p. 93).

Krause and Kyle's study was based on interviews with managers of 48 corn production units and 48 farm input manufacturers, retailers, and marketing firms (1970 and 1971). All farms interviewed produced at least 1000 acres of corn and were located in the corn belt. Input prices were collected for the 1969 and 1970 crop years. Analysis of the data collected found that a 5,000 acre corn operation had obtained discounts on purchased inputs that

were on average 20 percent greater than those obtained by a reference farm producing 500 acres of corn (Krause and Kyle, 1971, p. iii). However, substantial variation in the discounts reported existed among farms of the same size (Krause and Kyle, 1971, p. 14).

In the third study, Hall and LeVeen used 1974 agricultural census data to analyze California crop farms. They found that fertilizer prices were constant over all farm sizes except the smallest census farm class. For this class, prices had been 5 to 20 percent higher. While fertilizer was the only input whose cost could be directly compared across farm size, analysis of combined seed, fertilizer, pesticide, and fuel costs revealed that the largest farms did have slightly lower costs for these inputs. The advantage equalled between 0.5 and 2.0 cents per dollar of sales (Hall and LeVeen, p. 595-596).

Each of these three studies has increased the understanding of purchasing advantages of large farms. However, each also has a major limitation. Faris and Armstrong's study was based on a limited sample as was Krause and Kyle's study. Furthermore, the latter's study did not examine marketing advantages for farms with less than 1000 acres of corn. Needless to state, most farms which raise corn fall in this category. Lastly, Hall and LeVeen's study did not permit determination of whether the input cost savings were due to lower input prices and/or more efficient use of inputs.

Ohio Farm Operator Survey

To address some of the limitations of previous studies, a survey of Ohio farm operators conducted during March of 1981 was constructed in part to address the issue of input purchasing advantages associated with farm size. The surveyed operators were asked to indicate the average price discount received on seed, fertilizer, pesticides, and crop machinery purchased during the preceding 12 months. Length of the questionnaire and need to cover other topics limited the survey to these inputs.

The survey instrument was mailed to a randomly selected sample of 2005 Ohio farm operators. The survey was limited to farm operators farming at least 100 acres. This acreage limitation was arbitrarily selected in an attempt to limit the survey to commercial farm operators.

Usable surveys were obtained from 384 farm operators, yielding a response rate of 19.2 percent. Comparison of the age distribution of respondents with the age distribution of Ohio farm operators reported in the 1978 agricultural census revealed little difference between the two distributions (U.S., Department of Commerce). However, comparison of the farm size distribution of respondents with the 1978 census distribution of Ohio farms revealed that large farm operators were overrepresented among respondents. This finding is consistent with most surveys of farm operators and was expected. Nevertheless, the bias towards large farmers should be kept in mind when evaluating the survey results.

Information on discounts were collected by having farm operators check one of the following percent categories: zero, 0.1-5.0, 5.1-10.0, 10.1-15.0, 15.1-20.0, 20.1-25.0, 25.1-30.0, and 30+. Because few farm operators reported discounts greater than 20 percent, all operators reporting a 15 percent or greater discount were grouped into one category for the statistical analysis.

Categories were used on the questionnaire instead of asking for a specific percent discount because it was felt that most respondents would not have maintained detailed records on input discounts. Thus, a general indication was the most accurate information likely to be obtained.

Analysis of Survey Data

For seed, fertilizer, and pesticides a discount of five percent is generally offered to farmers who pay in cash within a specified time period.

Large farmers are generally thought to have greater access to credit (i.e., cash) than small farmers. On the other hand, small farmers generally receive a greater share of their income from nonfarm sources (U.S., Department of Agriculture, p. 7). Nonfarm income provides a cash flow which can be used to purchase farm inputs. Taken together, these arguments suggest that no relationship should exist between farm size and percent of farmers receiving a discount of five percent or less (but greater than zero). Examination of the data for seed, fertilizer, and pesticides generally confirms this expectation. (The category by category breakout of input discounts are contained in Appendix Tables 1-4). Consequently, the following discussion will initially focus on percent of respondents receiving discounts greater than five percent.

Table 1 presents the percent of respondents who reported discounts greater than five percent for seed, fertilizer, pesticides, and crop machinery. The farm size categories used in the table correspond to those used by the agricultural census.

Only for input purchases of farms exceeding 1000 acres and for seed and machinery purchases of farms between 500 and 999 acres did at least 36 percent of respondents report discounts in excess of five percent. On the other hand, at least 10 percent of respondents in all farm size-input categories reported receiving a discount greater than five percent. Thus, Table 1 suggests not only a strong relationship between farm size and input discount but also substantial variation in input discount received by farm operators with the same size farm.

To further investigate the relationship between farm size and size of input discount, an average discount was calculated for each farm size-input category (Table 2 and Figure 1). The average discount was calculated by using the midpoint of each input discount category and the percent of farm operators

Table 1: Percent of Farm Operators Reporting a Greater than Five Percent Discount on Seed, Fertilizer, Pesticides, and Crop Machinery by Acres Farmed, Ohio, 1980-1981.

Input	Acres					All Farmers
	100-179	180-259	260-499	500-999	1000+	
	- - - (percent)[a] - - -					
Seed	18.7	35.5	34.7	54.9	70.9	37.0
Fertilizer	19.2	15.0	23.7	22.2	50.0	22.4
Pesticides	9.7	16.8	19.5	24.6	69.6	21.0
Machinery	11.4	25.0	33.8	46.5	66.6	32.5

[a]Percents based on the following number of observations by input and increasing farm size; seed--107, 62, 92, 82, 24, and total = 367; fertilizer--109, 60, 93, 81, 24, and total = 367; pesticides--93, 54, 82, 73, 23, and total = 325; and crop machinery--70, 48, 74, 73, 21, and total = 286.

Source: Original Survey Data, March 1981.

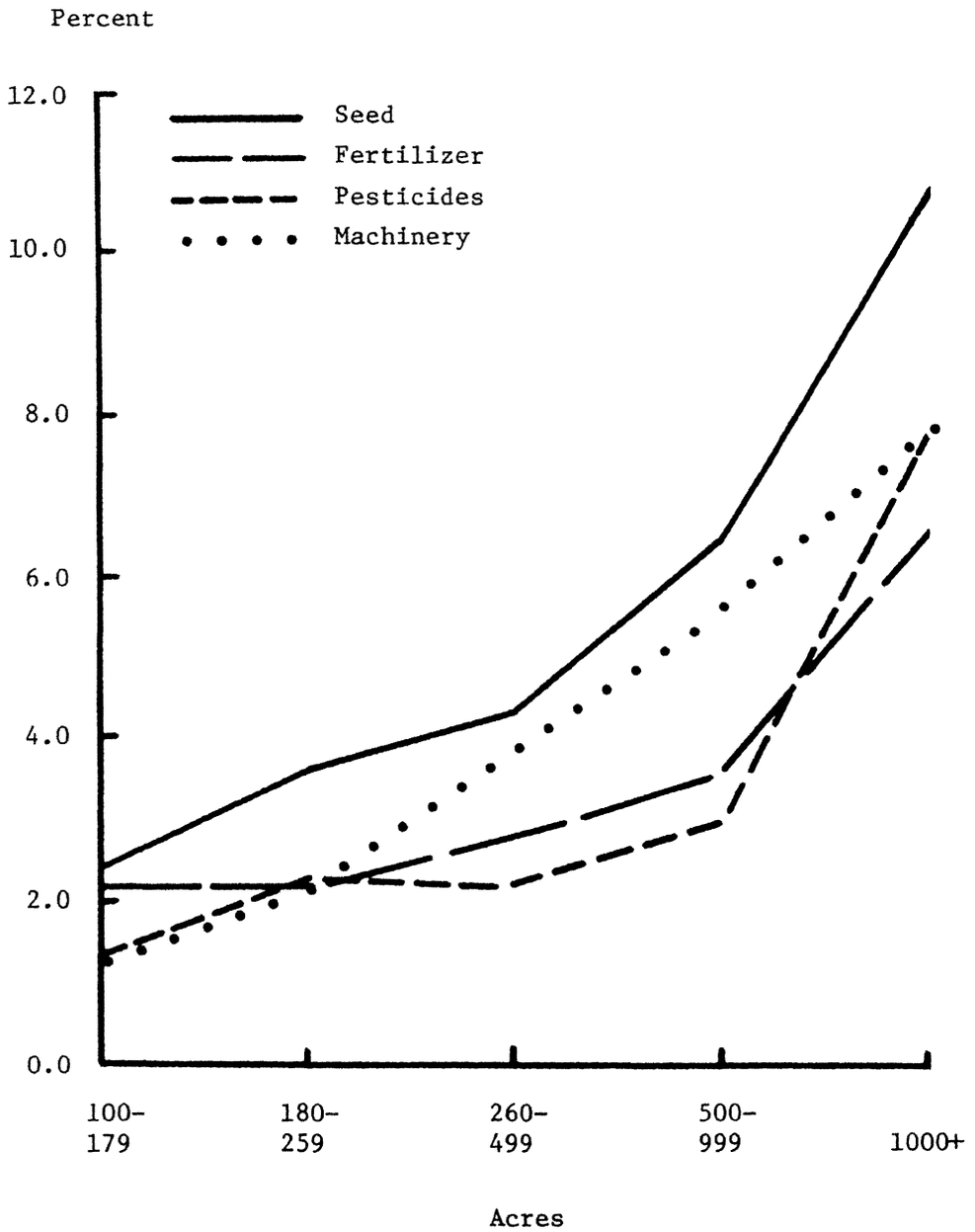
Table 2: Average Discount Reported by Farm Operators on Seed, Fertilizer, Pesticides, and Crop Machinery by Farm Size, Ohio, 1980-1981.

Input	Acres					All Farmers
	100-179	180-259	260-499	500-999	1000+	
	- - - (percent)[a] - - -					
Seed	2.4	3.6	4.3	6.5	10.8	4.5
Fertilizer	2.2	2.2	2.8	3.6	6.6	2.9
Pesticides	1.4	2.3	2.2	3.0	7.8	2.6
Machinery	1.3	2.2	3.8	5.6	7.9	3.7

[a]For number of observations on which percents are based see Table 1.

Source: Original Survey Data, March 1981.

Figure 1: Average Discount Reported by Farm Operators on Seed, Fertilizer, Pesticides, and Crop Machinery by Farm Size, Ohio, 1980-1981[a]



[a]For number of observations on which percents are based see Table 1.

Source: Original Survey Data, March 1981.

for each farm size who reported receiving that discount category. (17.5 was used as midpoint for the 15 plus category).

Overall, seed was reported as having been obtained at the highest average discount. Crop machinery was next, followed by fertilizer and pesticides. These rankings match those based on percent of total respondents reporting a discount greater than five percent. Also, note that seed had the highest average discount for all farm size categories.

For fertilizer and pesticides average reported discount was fairly stable for the four smallest farm sizes but increased substantially for farms over 1000 acres. In contrast, for seed and crop machinery average reported discount increased steadily with farm size, although the increase for seed between 500-999 acre and 1000 plus acre operations did match the increase between these two farm sizes for fertilizer and pesticides. Combined with similar evidence from Table 1, it would appear that the possibility of obtaining substantial discounts on fertilizer and pesticides was particularly affected by whether or not the farm was greater than 1000 acres.

To obtain a measure of the total advantage accruing to farm size in the purchase of seed, fertilizer, pesticides, and crop machinery; their average discounts were applied to the per acre cost of growing 120 bushel conventionally tilled corn as reported in the 1981 Ohio Crop Enterprise Budget (Duvick, editor). The cost of seed, fertilizer, pesticides, and machinery was $17, $57, $13, and $40 per acre respectively. Together they accounted for 63.5 percent of the variable plus machinery expenses. The higher per acre costs of fertilizer and machinery increase the importance of obtaining discounts for these inputs.

The following total per acre cost reductions were estimated: $2.35/acre for 100-179 acre operations, $3.05/acre for 180-259 acre operations, $4.12/acre

for 260-499 acre operations, $5.77/acre for 500-999 acre operations, and $9.73/acre for 1000+ acre operations. These calculations are based on the assumption that the quantity of inputs used is the same for all farm sizes. It is unlikely that this assumption holds. Nevertheless, the numbers do provide an indication of the monetray advantages obtained from purchasing inputs at discounts as farm size increases. Lastly, some farm operators farming over 1000 acres had an even greater advantage than that suggested by these numbers. The reason being that they were able to purchase the four inputs at discounts greater than the average discount for all farm operators with over 1000 acres.

The average per acre cost reductions can be translated into the higher price a farmer with over 1000 acres can potentially pay for land. Assume that everything but the discount received on the inputs is constant, that the farmer receives the average input discount for his size operation, that the farmer plans on owning the land for 30 years, and that the real rate of interest will average three percent over the 30 years. Given these assumptions, a farmer with a 1000+ acre operation can on average afford to pay $145/acre more than a farmer with a 100-179 acre operation and $61/acre more than a farmer with a 500-999 acre operation.

Limitations, Conclusions, and Implications

This study has attempted to broaden the knowledge base and therefore understanding of the input purchasing advantages of large farms. It should be noted that many factors besides farm size can influence the discounts a farmer receives on inputs. These factors include management ability, distance from the input supplier, cost of searching for information on input costs, quality of purchased inputs, services provided by the input supplier,

working relationship with the supplier, and time of year the input is purchased. However, the importance of these factors in determining the purchasing advantages of large farmers requires more detailed survey data than that collected for this study.

Given this limitation, three conclusions can be drawn from this study. First, the findings of this study conform with the findings of previous studies: as farm size increases, the size of input discounts increases. Second, also similar to previous studies, substantial variation was found in discount received (prices paid) by farm operators of the same size farm. This finding suggests that many farmers can lower their input costs by taking advantage of their ability to obtain input discounts. Lastly, this study found that input purchasing advantages was present even for farms with less than 500 acres. Therefore, size related advantages in purchasing inputs encourage farmers at all farm sizes to expand their operations.

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Appendix Table 1: Price Discount on Seed as Reported by Farm Operators by Acres Farmed, Ohio, 1980-1981.

Discount (percent)	Acres[a] 100-179	180-259	260-499	500-999	1000+	All Farmers
	- - - (percent) - - -					
0	54.2	38.7	32.6	14.6	4.2	34.1
0.1-5.0	27.1	25.8	32.6	30.5	25.0	28.9
5.1-10.0	14.0	32.3	23.9	30.5	4.2	22.6
10.1-15.0	2.8	1.6	4.3	17.1	37.5	8.4
15.0+	1.9	1.6	6.5	7.3	29.2	6.0
Total[b]	100.0	100.0	100.0	100.0	100.0	100.0

[a]Number of observations by category: 100-179, 107; 180-259, 62; 260-499, 92; 500-999, 82; 1000+, 24; and total, 367.

[b]Total may not equal 100 due to rounding.

SOURCE: Original Survey Data, March 1981.

Appendix Table 2: Price Discount on Fertilizer as Reported by Farm Operators by Acres Farmed, Ohio, 1980-1981.

Discount (percent)	Acres[a] 100-179	180-259	260-499	500-999	1000+	All Farmers
	- - - (percent) - - -					
0	57.8	48.3	48.4	35.8	29.2	47.1
0.1-5.0	22.9	36.7	28.0	42.0	20.8	30.5
5.1-10.0	17.4	11.7	18.3	11.1	16.7	15.3
10.1-15.0	0.9	3.3	5.4	4.9	20.8	4.6
15.0+	0.9	0.0	0.0	6.2	12.5	2.5
Total[b]	100.0	100.0	100.0	100.0	100.0	100.0

[a]Number of observations by category: 100-179, 109; 180-259, 60; 260-499, 93; 500-999, 81; 1000+, 24; and total, 367.

[b]Total may not equal 100 due to rounding.

SOURCE: Original Survey Data, March 1981.

Appendix Table 3: Price Discount on Pesticides as Reported by Farm Operators by Acres Farmed, Ohio, 1980-1981.

Discount (percent)	Acres[a] 100-179	180-259	260-499	500-999	1000+	All Farmers
	- - - (percent) - - -					
0	69.9	55.6	57.3	49.3	13.0	55.7
0.1-5.0	20.4	27.8	23.2	26.0	17.4	23.4
5.1-10.0	8.6	13.0	17.1	16.4	34.8	15.1
10.1-15.0	0.0	1.9	1.2	5.5	26.1	3.7
15.0+	1.1	1.9	1.2	2.7	8.7	2.2
Total[b]	100.0	100.0	100.0	100.0	100.0	100.0

[a]Number of observations by category: 100-179, 93; 180-259, 54; 260-499, 82; 500-999, 73; 1000+, 23; and total, 325.

[b]Total may not add to 100 due to rounding.

SOURCE: Original Survey Data, March 1981.

Appendix Table 4: Price Discount on Crop Machinery as Reported by Farm Operators by Acres Farmed, Ohio, 1980-1981.

Discount (percent)	Acres[a] 100-179	180-259	260-499	500-999	1000+	All Farmers
	- - - (percent) - - -					
0	85.7	72.9	63.5	46.6	33.3	64.0
0.1-5.0	2.9	2.1	2.7	6.8	0.0	3.5
5.1-10.0	5.7	20.8	16.2	20.5	28.6	16.4
10.1-15.0	4.3	2.1	10.8	13.7	19.0	9.1
15.0+	1.4	2.1	6.8	12.3	19.0	7.0
Total[b]	100.0	100.0	100.0	100.0	100.0	100.0

[a]Number of observations by category: 100-179, 70; 180-259, 48; 260-499, 74; 500-999, 73; 1000+, 21; and total, 286.

[b]Total may not add to 100 due to rounding.

SOURCE: Original Survey Data, March 1981.